ON SITE: LIVING IN SPACE

An orbiting space shuttle and everything aboard it, including the astronauts, are falling continuously around Earth. The result is apparent weightlessness—they experience microgravity conditions. Performing everyday tasks, such as sleeping and exercising, is challenging in microgravity. What would it be like to float in space?

Disorientation Some astronauts experience space sickness during the first few days in microgravity. This happens because the brain is confused by the mismatched visual, sensory, and pressure messages that it receives. To help their bodies prepare for microgravity, astronauts train in special airplanes where they experience short periods of free-fall weightlessness. Once sensory systems have adjusted to microgravity, space sickness subsides.

Sleeping How would you sleep without gravity to keep you in bed? Astronauts on the orbiting space shuttle and the *International Space Station* spend about eight hours a day sleeping. Although astronauts can sleep in any orientation they prefer, they must be anchored to something—a wall, a seat, or a bed. This prevents them from floating and bumping into other things while they sleep, which might harm them as well as other astronauts and equipment.

This astronaut is working in microgravity. Notice the footholds and handholds the astronauts use to stay in place.

Exercising In orbit, exercising is particularly important to the overall health of astronauts. On Earth, muscles work against the force of gravity to move, maintain balance, and support our bodies. In microgravity, muscles are underused and begin to atrophy, meaning they lose tone and mass.

Supporting the weight of the body on Earth is one of the functions of bones. Scientists know that gravity is important in the process of bone maintenance and formation. In microgravity, bone formation is disrupted and bones lose important minerals. Without proper amounts of these minerals, bones become weaker and the risk of fracture increases. Astronauts exercise each day while in space while strapped to exercise equipment.

WRITING in Earth Science

Interview Suppose you are a newspaper reporter and you will interview an astronaut who has returned from space. Write at least five interview questions about how microgravity affects the human body and the completion of everyday tasks. Include questions about the astronaut's personal experiences. To learn more about space travel, visit glencoe.com.

GEOLAB

MAPPING: DETERMINE RELATIVE AGES OF LUNAR FEATURES

Background: **Recall from Chapter 21 that an intrusion or a fault can cut across an older geologic feature. This principle of crosscutting relationships is also used to determine the relative ages of surface features on the Moon. By observing which features cut across others, you can infer which features are older and which are younger.**

Question: *How can you use images of the Moon to interpret relative ages of lunar features?*

Materials

paper
metric ruler

Procedure

1. Read and complete the lab safety form.
2. Review the information about the history of the Moon and the lunar surface starting on page 772.
3. Observe Photo 1 and identify the older of the craters in the crater Pairs A-D and C-B using the principle of crosscutting relationships.
4. Observe Photo 2. Identify and list the features in order of their relative ages.
5. Observe Photo 3. Identify the mare, rille, and craters. Then list the features in order of their relative ages.
6. Observe Photo 4. Identify the features using your knowledge of crosscutting relationships and lunar history. Then list the features in order of their relative ages.

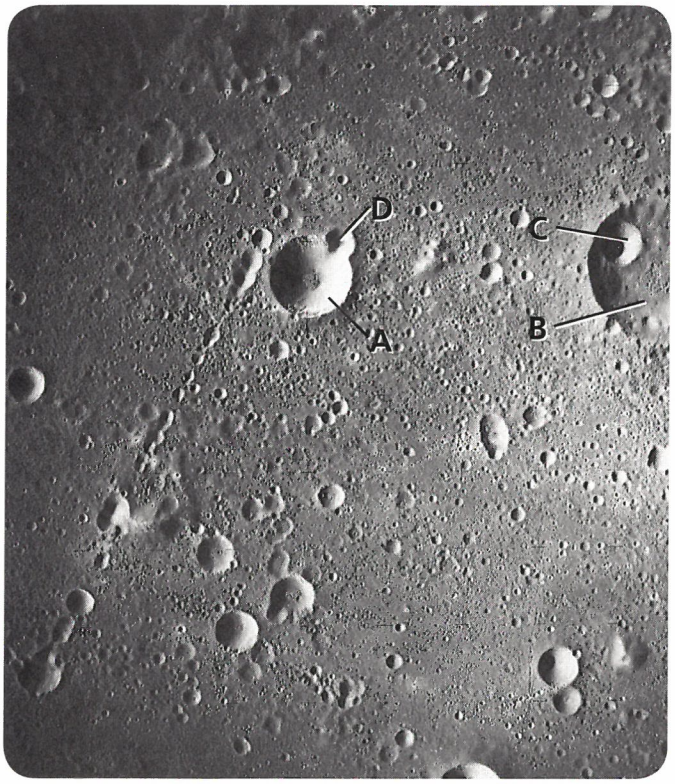
Analyze and Conclude

1. **Summarize** the problems you had in identifying and choosing the ages of the features.
2. **Select** Based on information from all the photos, what features are usually the oldest? The youngest?
3. **Explain** whether scientists could use this process to determine the exact age difference between two overlapping craters. Why or why not?
4. **Identify** the relative-age dating that scientists use to analyze craters on Earth.
5. **Evaluate** If the small crater in Photo 2, labeled *A*, is 44 km across, what is the scale for that photo? At that scale, what is the size of the large crater labeled *F*?
6. **Judge** Which would be older, a crater that had rays crossing it, or the crater that caused the rays? Explain.
7. **Estimate** If the crater labeled *A* in Photo 1 is 17 km across, how long is the chain of craters in the photo?
8. **Infer** What might have caused the chain of craters in Photo 1?

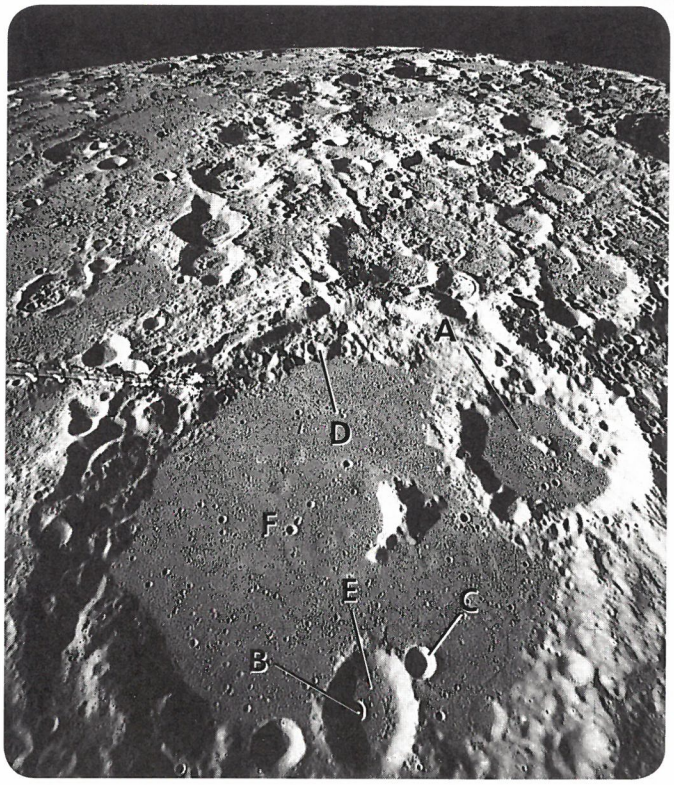
WRITING in Earth Science

Guidebook Using what you learned in this lab, prepare a guidebook that contains instructions for identifying and determining relative ages of lunar features. For more information on lunar features, visit glencoe.com.

1



2



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